**7. Sign Language Recognition Using Deep Learning on Custom Processed Static Gesture Images**

Sign Language Provides Tools To Communicate Just As Spoken Language Does. Similar To Spoken Languages, There Are Various Types Of Sign Languages As Well. Examples Include Polish Sign Language, American Sign Language, And Indian Sign Language. Technology In The Form Of Multiple Software Packages Has Been Developed For The Purpose Of Teaching And Understanding Sign Language.

We Were Able To Extract Features And Train The Dataset, Using The Traditional K-Means Algorithm. Points Of Local Maxima Were Used As K Clustering Centers To Initialize K Seeds In Order To Correctly Detect Various Parts Of The Body. Such As Torso, Hand, Etc. The Data They Acquired Was Using A 3 Mega Pixels Camera And Hence The Quality Was Poor.

Even Though Combining Finger Tip With PCA Provided A Good Result, A Better Output Can Be Obtained Using Neural Networks. Images Are On An Average 160 X 160 In Size, And Are Cropped Using A Python Script To Prevent Unnecessary Shapes From Being Detected. Convolutional Neural Networks Are Used To Detect Different Features In The Image; These Go From Basic To More Complete Features. 20% Of The Images Of Each Class Have Been Separated Out For Testing, And 20% Were Classified Into Their Appropriate Classes. Images Were Rotated By 5 Degrees And 10 Degrees In Both Clockwise And Anti-Clockwise Direction.

Images Were Split Into Training, Testing And Validation Sets Using A Custom Algorithm. The Top-Layer Was Retrained So That The New Classes Are Identified. We Were Able To Obtain Significant Results By Setting The Learning Rate At 0.05. Next, The Training Data For The New Model Is Loaded As A Graph In A Program Called Tensorflow. As A Result Of This Preliminary Run, Each Image Is Assigned A Percentage Confidence.

The Confidence Percent Depicts The Level Up To Which The Model Was Able To Predict The Result. After The First Prediction Run, The Labels Are Shown, Sorted In Order Of Confidence. As The Epochs Increase The Top Layer Of The Pretrained Neural Network Is Trained More For Our Dataset, We See An Increase In Validation Accuracy And Decrease In Cross Entropy. We Were Able To Obtain An Average Validation Accuracy Of 90% With The Greatest Validation Accuracy Being 98%. Using Inception V3, We Were Successfully Able To Use Convolutional Neural Networks For Correctly Recognizing Indian Sign Language And American Sign Language.